

LISTING OF CLAIMS

Claim 1. (Original): A light source comprising at least one light emitting diode (LED) assembly, said LED assembly including a base substrate, said base substrate including base solder or stud bumps, a submount substrate mounted on the base substrate, said submount substrate including submount solder or stud bumps, and an LED semiconductor chip mounted on the submount substrate and in electrical contact with the submount solder or stud bumps, said LED semiconductor chip being electrically coupled to the base substrate through electrical vias extending through the submount substrate that are in electrical contact with the substrate solder or stud bumps and the submount solder or stud bumps.

Claim 2. (Original): The light source according to claim 1 further comprising a molded lens formed over the LED assembly.

Claim 3. (Original): The light source according to claim 2 wherein the molded lens is an injection molded lens.

Claim 4. (Original): The light source according to claim 2 wherein the molded lens is in contact with the LED assembly so that there is not an air gap between the lens and the LED semiconductor chip.

Claim 5. (Original): The light source according to claim 4 wherein the lens is molded to the base substrate and completely encapsulates the submount substrate and the LED semiconductor chip.

Claim 6. (Original): The light source according to claim 2 further comprising a silicon gel formed between the LED assembly and the molded lens.

Claim 7. (Original): The light source according to claim 2 wherein the at least one LED assembly is a plurality of LED assemblies each including a separate molded lens.

Claims 8 - 14 (Cancelled)

Claim 15. (Original): The light source according to claim 14 wherein the reflective foil is formed to the lens when the lens is molded.

Claims 16 - 18 (Cancelled)

Claim 19. (Original): The light source according to claim 2 wherein the molded lens includes a phosphor material for converting light from the LED semiconductor chip to white light.

Claim 20. (Original): The light source according to claim 2 wherein the molded lens is a primary optic dome formed over the LED assembly.

Claim 21. (Original): The light source according to claim 1 wherein the at least one LED semiconductor assembly is a plurality of LED assemblies providing a predetermined light pattern, wherein each LED assembly in the plurality of LED assemblies provides a portion of the intensity of the entire light pattern.

Claim 22. (Original): The light source according to claim 1 wherein an electrode path printed on the semiconductor chip defines a light beam cutoff to define a shape of the beam emitted from the LED assembly.

Claim 23. (Original): The light source according to claim 1 wherein the at least one LED assembly further includes a phosphor layer deposited over the LED semiconductor chip, said LED semiconductor chip emitting blue light and said phosphor layer converting the blue light to white light.

Claim 24. (Original): The light source according to claim 23 wherein a light beam cutoff pattern of the LED assembly is printed into the phosphor layer.

Claims 25 - 27 (Cancelled)

Claim 28. (Original): The light source according to the claim 1 further comprising a heat sink mounted to the base substrate.

Claim 29. (Original): The light source according to claim 28 wherein the heat sink includes a plurality of spaced apart fins.

Claim 30. (Cancelled)

Claim 31. (Original): The light source according to claim 1 wherein the light source is a vehicle light source.

Claim 32. (Original): The light source according to claim 31 wherein the light source is a vehicle headlight.

Claim 33. (Original): The light source according to claim 32 wherein the LED assembly is sealed from the environment.

Claim 34. (Original): The light source according to claim 32 further comprising a carrier, said base substrate being mounted to the carrier.

Claim 35. (Original): The light source according to claim 33 further comprising a headlight housing, said carrier being pivotally mounted to the headlight housing by an adjuster and a pivot element so as to direct the headlight in two-axis of freedom.

Claim 36. (Original): The light source according to claim 35 further comprising a flexible boot, said flexible boot being mounted to the carrier and the headlight housing so as to allow the carrier to be rotated and to maintain the seal integrity.

Claim 37. (Original): The light source according to claim 36 wherein the flexible boot is co-molded to the headlight housing and the carrier.

Claim 38. (Original): The light source according to claim 36 wherein the flexible boot is co-molded to the headlight housing and a mechanical clip, and wherein the mechanical clip is clipped to the carrier.

Claim 39. (Original): The light source according to claim 36 wherein the flexible boot is a rubber boot.

Claim 40. (Original): A light source comprising at least one light emitting diode (LED) assembly, the LED assembly including an LED semiconductor chip and a substrate, said semiconductor chip being electrically coupled to the substrate, said LED assembly further including a molded primary optic formed over the LED assembly in contact with the substrate so that there is not an air gap between the primary optic and the LED semiconductor chip.

Claim 41. (Original): The light source according to claim 40 wherein the primary optic is an injection molded optic.

Claim 42. (Original): The light source according to claim 41 wherein the primary optic is an injection molded dome on the substrate.

Claim 43. (Original) The light source according to claim 40 further comprising a silicon gel formed between the primary optic and the semiconductor chip.

Claim 44. (Original): The light source according to claim 40 wherein the primary optic is molded to the substrate and completely encapsulates the LED assembly.

Claims 45 - 47 (Cancelled)

Claim 48. (Original): The light source according to claim 46 wherein the optical structure includes a phosphor material for converting light from the LED semiconductor chip to white light.

Claims 49 - 52 (Cancelled)

Claim 53. (Original): The light source according to claim 52 wherein the reflective foil is formed to the primary optic when the primary optic is molded.

Claims 54 - 56 (Cancelled)

Claim 57. (Original): The light source according to claim 40 wherein the primary optic includes a phosphor material for converting light from the LED semiconductor chip to white light.

Claim 58. (Original): The light source according to claim 40 wherein the at least one LED assembly further includes a phosphor layer deposited over the LED semiconductor chip, said LED semiconductor chip emitting blue light and said phosphor layer converting the blue light to white light.

Claim 59. (Original): The light source according to claim 58 wherein a light beam cutoff pattern of the LED assembly is printed into the phosphor layer.

Claim 60. (Original): The light source according to claim 58 wherein the at least one LED assembly is a plurality of LED assemblies providing a predetermined light pattern, wherein each LED assembly in the plurality of LED assemblies provides a portion of the intensity of the entire light pattern.

Claim 61. (Original): The light source according to claim 40 wherein an electrode path printed on the semiconductor chip defines a beam cutoff to define a shape of the beam emitted from the LED assembly.

Claims 62 - 64 (Cancelled)

Claim 65. (Original): The light source according to the claim 40 further comprising a heat sink mounted to the substrate.

Claim 66. (Original): The light source according to claim 65 wherein the heat sink includes a plurality of spaced apart fins.

Claim 67. (Cancelled)

Claim 68. (Original): The light source according to claim 40 wherein the light source is a vehicle light source.

Claim 69. (Original): The light source according to claim 68 wherein the light source is a vehicle headlight.

Claim 70. (Original): The light source according to claim 69 wherein the LED assembly is sealed from the environment.

Claim 71. (Original): The light source according to claim 70 further comprising a carrier, said base substrate being mounted to the carrier.

Claim 72. (Original): The light source according to claim 71 further comprising a headlight housing, said carrier being pivotally mounted to the headlight housing by an adjuster and a pivot element so as to direct the headlight in two-axis of freedom.

Claim 73. (Original): The light source according to claim 72 further comprising a flexible boot, said flexible boot being mounted to the carrier and the headlight housing so as to allow the carrier to be rotated and to maintain the seal integrity.

Claim 74. (Original): The light source according to claim 73 wherein the flexible boot is co-molded to the headlight housing and the carrier.

Claim 75. (Original): The light source according to claim 73 wherein the flexible boot is co-molded to the headlight housing and a mechanical clip, and wherein the mechanical clip is clipped to the carrier.

Claim 76. (Original): The light source according to claim 73 wherein the flexible boot is a rubber boot.

Claim 77. (Original): A vehicle headlight comprising at least one headlight unit, said at least one headlight unit including an optical structure, said at least one headlight unit further including a plurality of spaced apart primary optic lenses optically coupled to a front face of the optical structure, said at least one headlight unit further including a plurality of light emitting diode (LED) assemblies, where a single LED assembly is provided for each lens, wherein each LED assembly emits a beam of light that is focused and directed by the elongated lens and is collected and directed by the optical structure to be emitted from the front face of the optical structure as a single beam of light, wherein each LED assembly in the plurality of LED assemblies provides a portion of the intensity of the entire light pattern.

Claims 78 - 81 (Cancelled)

Claim 82. (Original): The headlight according to claim 77 wherein each lens is an injection molded lens.

Claim 83. (Cancelled)

Claim 84. (Original): The headlight according to claim 83 wherein the reflective foil is formed to the lens when the lens is molded.

Claim 85. (Original): The headlight according to claim 77 wherein the primary optic lens is an injection molded dome.

Claim 86. (Original): The headlight according to claim 77 wherein each lens includes a phosphor material for converting light from the LED assembly to white light.

Claim 87. (Original): The headlight according to claim 77 wherein the optical structure includes a phosphor material for converting light from the LED assembly to white light.

Claim 88. (Cancelled)

Claim 89. (Original): The headlight according to claim 77 wherein the plurality of LED assemblies and lenses is six lenses and six LED assemblies.

Claim 90. (Original): The headlight according to claim 77 wherein each LED assembly includes an LED semiconductor chip that emits blue light and a phosphor layer that converts the blue light to white light.

Claim 91. (Original): The headlight according to claim 90 wherein a light beam cutoff pattern of the LED assembly is printed into the phosphor layer.

Claims 92 - 94 (Cancelled)

Claim 95. (Original): The headlight according to claim 77 wherein the plurality of LED assemblies is mounted to a common carrier.

Claim 96. (Original): The headlight according to claim 95 further comprising a headlight housing, said carrier being pivotally mounted to the headlight housing by an adjuster and a pivot element to direct the headlight in two degrees of freedom.

Claim 97. (Original): The headlight according to claim 96 further comprising a flexible boot, said flexible boot being mounted to the carrier and the headlight housing so as to allow the carrier to be rotated and maintain a headlight seal integrity.

Claim 98. (Original): The headlight according to claim 97 wherein the flexible boot is co-molded to the headlight housing and the carrier.

Claim 99. (Original): The headlight according to claim 97 wherein the flexible boot is co-molded to the headlight housing and a mechanical clip, and wherein the mechanical clip is clipped to the carrier.

Claim 100. (Original): The headlight according to claim 97 wherein the flexible boot is a rubber boot.

Claim 101. (Original): The headlight according to claim 95 wherein the carrier includes a heat sink.

Claim 102. (Original): The headlight according to claim 101 wherein the heat sink includes a plurality of spaced apart fins.

Claim 103. (Cancelled)

Claim 104. (Currently Amended): A vehicle headlight comprising at least one headlight unit, said at least one headlight unit ~~including an optical prism and a plurality of spaced apart molded elongated lenses optically coupled to a front face of the prism, each elongated lens including a head portion and a body portion, said at least one headlight unit further~~ including a plurality of light emitting diode (LED) assemblies, where a single LED assembly is provided for each lens, said LED assembly including a base substrate, said base substrate including base solder or stud bumps, a submount substrate mounted on the base substrate, said submount substrate including submount solder or stud bumps, and an LED semiconductor chip mounted on the submount

substrate and in electrical contact with the submount solder or stud bumps, said LED semiconductor chip being electrically coupled to the base substrate through electrical vias extending through the submount substrate that are in electrical contact with the substrate solder or stud bumps and the submount solder or stud bumps, wherein each LED assembly emits ~~a beam of light that is focused and directed by the elongated lens and is collected and directed by the prism to be emitted from the front face of the prism~~ as a single beam of light.

Claims 105 - 115 (Cancelled)

Claim 116. (Original): The headlight according to claim 104 wherein each LED assembly further includes a phosphor layer deposited over the LED semiconductor chip, said LED semiconductor chip emitting blue light and said phosphor layer converting the blue light to white light.

Claim 117. (Original): The headlight according to claim 104 wherein an electrode path printed on the LED semiconductor chip defines a beam cutoff to define a shape of the beam emitted from the LED assembly.

Claims 118 - 120 (Cancelled)

Claim 121. (Original): The headlight according to claim 104 wherein the plurality of LED assemblies provide a predetermined light pattern, and wherein each LED assembly in the plurality of LED assemblies provides a portion of the intensity of the entire light pattern.

Claim 122. (Original): The headlight according to claim 104 wherein all of the LED assemblies are mounted to a common carrier.

Claim 123. (Original): The headlight according to claim 122 further comprising a headlight housing, said carrier being pivotally mounted to the headlight housing by an adjuster and a pivot element to direct the headlight in two degrees of freedom.

Claim 124. (Original): The headlight according to claim 123 further comprising a flexible boot, said flexible boot being mounted to the carrier and the headlight housing so as to allow the carrier to be rotated and maintain a headlight seal integrity.

Claim 125. (Original): The headlight according to claim 124 wherein the flexible boot is co-molded to the headlight housing and the carrier.

Claim 126. (Original): The headlight according to claim 124 wherein the flexible boot is co-molded to the headlight housing and a mechanical clip, and the mechanical clip is clipped to the carrier.

Claim 127. (Original): The headlight according to claim 124 wherein the flexible boot is a rubber boot.

Claim 128. (Original): The headlight according to claim 122 wherein the carrier includes a heat sink.

Claim 129. (Original): The headlight according to claim 128 wherein the heat sink includes a plurality of spaced apart fins.

Claim 130. (Cancelled)

Claim 131. (Original): A method of making an LED lamp, said method comprising:

electrically coupling an LED to a substrate by a solder reflow process; and
depositing a phosphor layer over the LED after it is electrically coupled to the substrate.

Claim 132. (Original): The method according to claim 131 wherein the LED is a blue LED and the phosphor layer generates white light from the blue light.

Claim 133. (Original): The method according to claim 131 wherein the solder is selected from the group consisting of tin-lead, tin-copper and tin-silver.

Claim 134. (Original): The method according to claim 132 wherein the solder has a melting temperature above 200°C.

Claim 135. (Original): The method according to claim 131 wherein depositing the phosphor layer over the LED includes simultaneously depositing the phosphor layer over a plurality of LEDs using a stencil mask.